A discrete-time system with uncertainty information

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Abstract. This paper considers a discrete-time queueing system with uncertainty information, that is, an arriving customer may opt, with a certain probability, to be served under a Last Come First Served (LCFS) discipline or, with complementary probability, becomes a negative customer. The arrival of a negative customer to the system removes the customer that is currently being served, if any, and has no effect on the system if the server is free. The input stream of the arriving customers is described by means of a Bernoulli process, and the service times are geometrically distributed. Breakdowns can occur, that is, the possibility of a server failure during the service time of a customer is considered, and the customer that was receiving its service in the moment of a failure of the server goes to the first place of the queue. The server has a general life time distribution, and the repair times are ruled by an arbitrary distribution.

A thorough study of the model is carried out, and, using a generating function approach, the steady-state distributions of the number of customers in the queue and in the system are obtained. We also give a necessary and sufficient condition for the stability of the system. Characteristics measures of the model are also given. Finally, some numerical examples to illustrate the effect of the parameters on several performances measures of the system are presented.